

# THE ACUPUNCTURE ANESTHESIA OF He Gu (LI-4), NEI GUAN (P-6), BiNao (LI-14) AND JIAN LIAO (TB-14) REDUCE DEMAND FOR GENERAL ANESTHETICS ON THE MODIFIED RADICAL MASTECTOMY

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## ABSTRACT

*The acupuncture has a sedative and analgesic effect's that can reduce the need of general anesthesia. The acupuncture maybe an adjunct for the better post-operative outcome. A randomized controlled trial on 60 patients underwent a modified radical mastectomy divided into two groups. In General Anesthesia or Non-Acupuncture (Group NA, n=30). The Acupuncture group (Group A, n=30) treated using 10 Hz electric power supply for bilateral acupuncture points of He Gu (LI-4), Neiguan (P-6), Binao (LI-14) and Jianliao (TB-14), provided 30 minutes before induction of anesthesia until the operation ended. The anaesthetic induction started with the injection of 2 mcg/kg fentanyl followed by propofol 1 mg/kg titrated every 30 seconds until negative eyelash reflex, continued with assisted ventilation of isoflurane, N<sub>2</sub>O and O<sub>2</sub>. Atracurium 0.5 mg/kg given, then laryngoscopy intubation. Blood pressure, pulse rate, O<sub>2</sub> saturation, PRST score, Bispectral Index (BIS) score, end-tidal isoflurane, recorded every 15 minutes started from induction of anesthesia until operation completed. Visual analog scale (VAS) pain score, Ramsay sedation and Utrecht vomiting score observed postoperatively.*

*Data analysed by t-test, Mann Whitney, and Multiple Analysis of Variance (MANOVA).*

*Group A needed 60 mg propofol, Group NA 106.7 mg (p= 0.000); Group A fentanyl 122.3 µg, group NA 213.3 µg (p= 0.000); the mean end-tidal isoflurane of Group A 1.5vol%, Group NA 1.7 vol% (p= 0.000). Groups A and NA had the median VAS pain scored 2 and 4, Ramsay sedation and Utrecht vomiting scored 0 (p > 0.05, no statistical difference). The acupuncture as adjuvant lowering the need for anesthetic gas and analgesics. It was no statistical difference between the Acupuncture group and General Anesthesia group.*

**KEYWORDS:** Acupuncture, Anesthesia, Propofol, Fentanyl, Isoflurane & Modified Radical Mastectomy

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## INTRODUCTION

Modified radical mastectomy operation typically performed using general anesthesia. However, general anesthesia cannot provide post-operative pain control. Even though the clinical importance remains uncertain, several clinical studies had demonstrated that general anesthetics, although they produce the desired state of unconsciousness, do not eliminate the surgical stress response, immunosuppression, and may cause undesirable side effects<sup>(1)</sup>. Post-operative nausea and emesis are some of the most unpleasant side effects up to 24 hours after breast cancer surgery requiring general anesthesia and resulted 56% of patients suffered nausea and vomiting<sup>(2)</sup>.

Acupuncture has sedative and analgesic effects that can help to reduce the anesthetic drugs needed during general anesthesia and may be used as an adjunct for increasing postoperative outcome<sup>(3,4,5,6)</sup>.

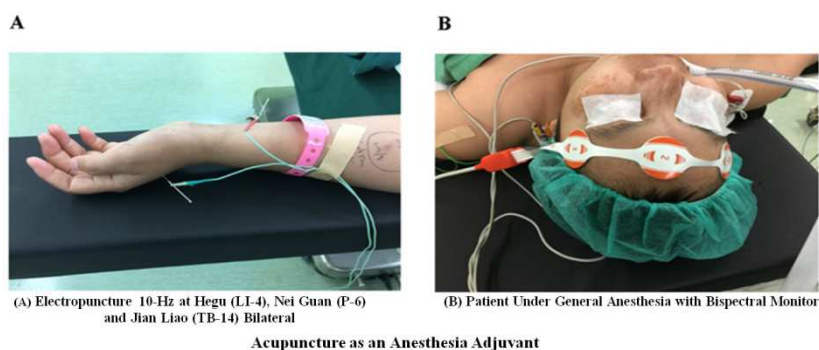
## MATERIALS AND METHODS

### Clinical Trial

This study was a prospective double-blinded conducted on 60 patients undergoing modified radical mastectomy randomized in two groups: Acupuncture (n= 30) group or Non-Acupuncture (control, n=30) group. The study was performed in Dr. Hasan Sadikin General Hospital, Bandung on February-June 2018. Participation was voluntary without economical compensation, and each participant signed a written consent. Exclusion criteria include pre-existing infections, cardiovascular conditions, or elevated levels of blood glucose. All patients underwent the induction of anesthesia began with the injection of fentanyl 12 mcg/kg followed by titration of propofol 1 mg/kg every 30 seconds until the eyelash reflex was negative, continued with assisted ventilation of isoflurane, N<sub>2</sub>O and O<sub>2</sub>, given a muscle relaxant atracurium 0.5 mg/kg and then laryngoscopy intubation. Maintenance doses of end tidal isoflurane to achieve adequate level of anesthesia with BIS monitor on a scale of 40-60, N<sub>2</sub>O:O<sub>2</sub>=2 L/min:2 L/min. Additional analgesic fentanyl 1 mcg/kg given when Pressure Rate Sweating Tears (PRST) score more than 4 or increased pulse rate > 30 from baseline. Recording of blood pressure, pulse rate, O<sub>2</sub> saturation, PRST score, Bispectral Index (BIS) score and end tidal isoflurane started before induction of anesthesia every 15 minutes until the operation was completed.

### Electro-Acupuncture (EA)

Acupuncture consisted of 30-minute treatment stimulating simultaneously the He Gu (LI-4), Nei Guan (PC-6), Bi Nao (LI-14) and Jian Liao (SJ-14) bilateral until the operation completed (Figure 1). Electro-acupuncture performed by a licensed anesthesiologist and acupuncturist delivered by a stimulator (Elektroakupunktur Great Wall KWD 808, Hongkong) at a 10-Hz frequency with a continuous electrical current of the wave through 30-gauge EA needles.



**Figure 1: Acupuncture as General Anesthesia Adjuvant**

Anesthetic requirements were determined by the total amount of fentanyl or propofol and average dose of isoflurane. Visual analog scale (VAS) pain score, Ramsay sedation and Utrecht vomiting score observed post-operatively.

## Statistical Analyses

We hypothesized that intra-operative EA may lower anesthetic requirement. The outcome was analyzing pain, sedation and vomiting score. The sample size was determined using standard deviation values and power analyses of our previous studies on EA in oncologic surgery. Statistical analyses were performed using the SPSS for Windows 17.0 version. Non-normal distributions were analysed with the nonparametric Mann Whitney U test. Mean values with normal distribution of two experimental groups were analyzed using the parametric Student 't' test. Multiple analysis of variance (MANOVA) was used to analyze the three factors of anesthetics requirement. The p-value less than 0.05 was considered that a significant difference did exist.

## RESULTS

The characteristics of the patients undergoing modified radical mastectomy (age, body weight, and length of surgery) were similar in the Acupuncture (group A) and control Non-Acupuncture (group NA) (Tables 1).

**Table1: Characteristics of the Patients**

Characteristic	Acupuncture (n=30)		Non-Acupuncture (n=30)		*p
	Mean	SD	Mean	SD	
Age (y)	42.5	(4.1)	42.9	(4.0)	0.708
Weight (kg)	60.0	(6.5)	59.7	(6.3)	0.841
BMI (kg/m <sup>2</sup> )	21.1	(1.9)	21.1	(1.9)	0.896
Systole (mmHg)	123.5	(5.5)	123.5	(5.3)	0.981
Diastole (mmHg)	79.3	(7.0)	79.9	(6.2)	0.713
MAP (mmHg)	93.7	(6.3)	94.0	(5.5)	0.827
Heart rate (/minute)	77.4	(8.6)	76.8	(7.9)	0.790
Oxygen saturation (%)	97.0	(1.5)	96.7	(1.3)	0.351
Length of surgery (minute)	179.0	(18.0)	178.0	(18.9)	0.834
Length of anesthesia (minute)	209.0	(18.0)	208.0	(18.9)	0.834

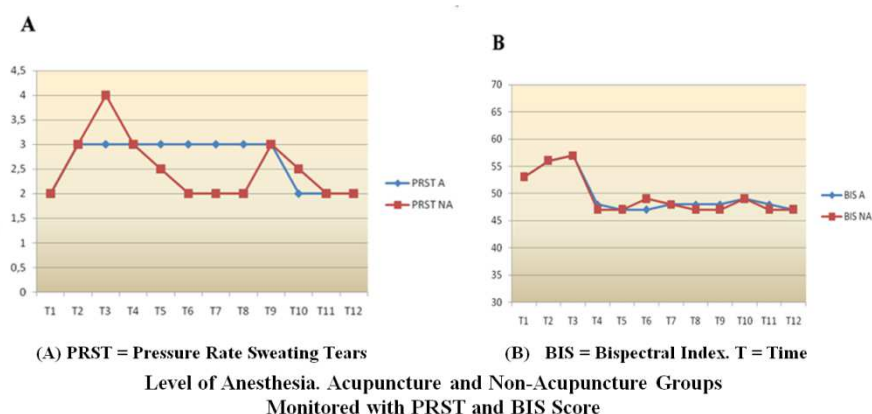
\* p < 0,05 Statistical Significance.

SD = Standard Deviation.

BMI = Body Mass Index.

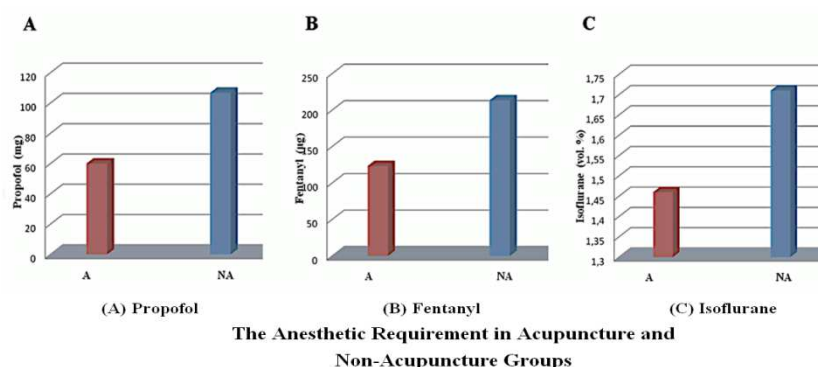
MAP = Mean Arterial Pressure.

All patients were under general anesthesia during the EA. They were blinded to the treatment to avoid any placebo effect. The EA patients had a similar level of anesthesia monitored with PRST and BIS score compared with the control group (Figure 2).



**Figure 2: Level of Anesthesia Monitoring with PRST and BIS**

We also compared the use of sedative, analgesic and volatile anesthetic on both groups. EA significantly reduced the request for propofol, fentanyl, and isoflurane (Figure 3). Propofol need of group A 60.0 mg was lower than control group 106.7 mg ( $p= 0.000$ ). The Fentanyl need of group A 122.3  $\mu\text{g}$  was lower than control group 213.3  $\mu\text{g}$  ( $p= 0.000$ ). The mean end-tidal isoflurane of group A 1.5vol% lower than in control group 1.7 vol% ( $p= 0.000$ ). In the post-operative period, patients with or without EA had the same scores of pain, sedation, and vomiting. The median VAS pain scored 2 and 4, Ramsay sedation and Utrecht vomiting scored 0 ( $p > 0.05$ , no statistical difference).



**Figure 3: Anesthetic Requirement**

## DISCUSSIONS

All patients had similar characteristics, levels of anesthesia and postoperative outcome. EA required fewer sedatives, analgesics, volatile anesthetics in the intraoperative period. These results are significant for the said reasons: a) sedative effect of EA was useful for induction of anesthesia. b) despite the general anesthesia, EA-induced an antinociceptive effect; c) after anesthesia, the groups had similar analgesic requirements and pain score. The lower request for analgesics in the EA group was a transient effect.

EA increased serum  $\beta$ -endorphin levels to produce an analgesic effect. When the serum  $\beta$ -endorphin levels of the pre and post EA applications are compared, an increase in the serum  $\beta$ -endorphin levels were observed in the EA group. Serum  $\beta$ -endorphin levels were increased from  $16.4 \pm 3.8$  pg/ml to  $21.4 \pm 4.5$  in the EA group<sup>(7)</sup>. The results of human and animal studies suggest that acupuncture provides a neuromodulating input into the central nervous system that can activate multiple analgesic or pain modulating systems involving neurotransmitters such as endogenous opioids. In fact, the most

frequently cited mechanism of action for the analgesic properties of acupuncture involves induction of endogenous opioid production and release. In human subjects in whom pain was relieved by acupuncture, an increase in cerebro-spinal fluid (CSF) endorphin level was noted<sup>(8)</sup>. Stimulation of acupuncture points can raise the endorphin level in the brain and can lead to an increase in activity of the opioidergic system, including pan-opioid activity and beta-endorphin levels in the plasma<sup>(9)</sup>.

The anti-inflammatory effects of EA with lower cortisol serum could prevent post-operative stress. Previous studies on EA were performed on the conscious patients susceptible to placebo. Many studies were performed in diabetic patients with EA at the CV-12 acupoint to induce insulin production. Post-operative hyperglycemia is an insulin resistance process that exacerbates inflammation; delays wound healing and infections. Given that EA reduced ACTH serum levels and that ACTH can induce insulin-resistant hyperglycemia<sup>(10)</sup>.

The attributive effect of acupuncture had been investigated in inflammatory diseases, including asthma, rhinitis, inflammatory bowel disease, rheumatoid arthritis, epicondylitis, complex regional pain syndrome type 1 and vasculitis. Larger randomized trials demonstrating the immediate and sustained effect of acupuncture were missing. The acupuncture controlled the release of neuropeptides from nerve endings and subsequent vasodilative and anti-inflammatory effects through calcitonin gene-related peptide. There were complex interactions with substance P, the analgesic contribution of  $\beta$ -endorphin and the balance between cell-specific proinflammatory and anti-inflammatory cytokines tumor necrosis factor- $\alpha$  and interleukin-10<sup>(11)</sup>. There has been no systematic review examining the effect of acupuncture on the endocrine system. There are some difficulties in identifying the effects of acupuncture on cortisol levels. More rigorous trials with larger scales need to be conducted to clarify the effects of acupuncture on cortisol levels<sup>(12)</sup>. In a German study by Schneider *et al.* (2007), the effect of acupuncture assessed on autonomic nervous system response and pain in the treatment of irritable bowel syndrome. Pain control was improved and also found that patients had lower salivary cortisol levels after acupuncture treatments<sup>(13)</sup>.

Reduced volatile or opioid anesthetics need a clinically significant result because it reduces anesthetic toxicity and time of recovery. The evidence suggests that inadequately treated pain, during general anesthesia, caused by pain pathways activation. The subsequent release of local mediators then primes the pain-sensing systems and aggravates postoperative pain. Intraoperative acupuncture hinders pain pathways and creates analgesia, and less post-operative pain and diminish opioid<sup>(14,15)</sup>. Anesthesia together with acupuncture is safe, and attenuating the opioids and post-operatively more convenient compared with only pure anesthesia<sup>(6,16)</sup>. The volatile anesthetic requirements reduced using acupuncture. The electroacupuncture creates a small but statistically significant reduction of halothane requirement in anesthetized dogs<sup>(17)</sup>. When acupuncture stimulation initiated after the induction of general anesthesia, transcutaneous electrical stimulation of the lateralization-control point near the ear tragus reduces the anesthetic requirement to acute noxious stimulation by 11-7%<sup>(18)</sup>.

Intra-operative acupuncture and related techniques have been advocated for the pre-operative sedation, to reduce intra-operative opioid use, and to decrease the post-operative pain. There is a coercing evidence that acupuncture eliminates nausea and vomiting, may also stabilize cardiac function and ameliorate some consequences of anesthesia and surgery. Intra-operative acupuncture can divide into three components: a) pre-operative preparation; b) intra-operative acupuncture-assisted anesthesia and c) post-operative care, includes post-operative pain control, nausea and vomiting reduction, and normalization of bowel function<sup>(3)</sup>. In this work, EA decreased vomiting score, but there was no statistically

significant difference. More acupuncture research with a greater number of patients is needed to confirm the evidence of volatile anesthetic requirement and PONV, especially after radical mastectomy.

## CONCLUSIONS

- The study proves that intra-operative electro-acupuncture reduced demand of anesthetics on patients modified radical mastectomy surgery under general anesthesia.
- It was no difference between acupuncture and non-acupuncture groups in post-operative outcomes including pain, sedation and vomiting score.

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